

REMARKS

Claims 1, 4-18, 33, and 34 are pending in the application. Claims 2 and 3 have been cancelled, and claims 1, 4, 5, and 12 have been amended herein. Claims 33 and 34 have been added.

Claims 1 and 4-18 have been variously rejected under 35 U.S.C. §§ 102, 103, and 112. For at least the reasons stated below, Applicant asserts that all claims are now in condition for allowance.

1. 35 U.S.C. § 112 Rejections

Claims 12-18 have been rejected under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 has been amended to clarify the antecedent basis for claims 13-18. Claim 12 has been amended to clarify the term FOTURAN therein.

Applicant respectfully requests that these rejections be withdrawn.

2. 35 U.S.C. § 102 Rejections

A. Claims 1, 4, 7, 10, and 13-16

Claims 1, 4, 7, 10, and 13-16 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Bertram et al. (U.S. Patent 4,085,398). Applicant respectfully opposes these rejections. Applicant asserts that not every element of every claim, as amended, is taught by the reference. MPEP § 2131 provides:

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “The identical invention must be shown in as complete detail as is contained in the ... claim.” Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim...

The present invention generally provides for a physical property sensor, including the following elements (with element labels added for ease in identifying the recited elements):

- (a) a substantially solid insulating sensor body having a front surface and a back surface, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;

- (b) a plurality of sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of sensing elements including at least one thermal sensor and at least one heater; and
- (c) a connection material filling the plurality of openings such that the plurality of sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

Because not every element of every claim is taught by the reference, Examiner's § 102 rejections are unsupported by the art and should be withdrawn.

Element (b) of independent claim 1 requires a plurality of sensing elements, including a heater and a thermal sensor. Bertram describes a resistance temperature detector, or "resistance thermometer," and provides for a substrate with two lead wires configured through two holes through the substrate. A temperature sensitive, resistive film lies over the top of the substrate and creates a resistive path across the two lead wires. See column 1, line 67—column 2, line 7; column 2, lines 28-33; Figure 2. Bertram does not disclose a "plurality of sensing elements," but only a single resistive film. Moreover, nowhere does Bertram describe a "heater" as set forth in claim 1.

For at least the reasons stated above, Bertram clearly does not show the "identical invention" and "every element" of independent claim 1. Accordingly, Applicant respectfully requests that the Examiner's § 102 rejection as to claim 1 be withdrawn.

Because Bertram fails to expressly or inherently describe each and every element as set forth in independent claim 1, Bertram also fails to describe each and every element set forth in claims 4, 7, 10, and 13-16, which depend upon independent claim 1. Accordingly, Applicant respectfully requests that the Examiner's § 102 rejections as to claims 4, 7, 10, and 13-16 also be withdrawn.

B. Claims 1, 4, 5, 8, and 14

Claims 1, 4, 5, 8, and 14 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Strott et al. (U.S. Patent 5,057,811). Applicant respectfully opposes these rejections. Because not every element of every claim (as amended) is taught by the reference, the Examiner's § 102 rejections are unsupported by the art and should be withdrawn.

Element (b) of independent claim 1 requires a plurality of sensing elements for monitoring the properties of a fluid, including a heater and a thermal sensor.

Initially, Strott describes an electrothermal sensor for use in power controllers. The Strott device is used to protect against thermal buildup in a power system. More importantly, Strott does not deal with physical property sensing. Referring now to the device described in Strott, it includes an insulating layer 4 and electrically coupled thermistors 3, 12, 13 on the insulating layer. See column 4, line 23—column 5, line 6. By running a current through a nearby shunt 5, one of the thermistors 3 is heated up relative to the other thermistors 12, 13. By measuring the temperature/resistance difference between thermistors, Strott describes determining when thermal buildup has exceeded a predetermined level. See column 5, lines 6-31; Figures 1 and 2. Though Strott involves the heating of thermistors, Strott does not disclose a heater as set forth in claim 1. Strott also does not teach a plurality of sensing elements for monitoring fluid properties as set forth in claim 1. Rather, Strott teaches the use of thermistors for measuring the temperature of the shunt 5.

Nowhere does Strott describe a plurality of sensing elements for monitoring the properties of a fluid, including a heater. For at least the reasons stated above, Strott clearly does not show the “identical invention” and “every element” of independent claim 1. Accordingly, Applicant respectfully requests that the Examiner’s § 102 rejection as to claim 1 be withdrawn.

Because Strott fails to expressly or inherently describe each and every element as set forth in independent claim 1, Strott also fails to describe each and every element set forth in claims 4, 5, 8, and 14, which depend upon independent claim 1. Accordingly, Applicant respectfully requests that the Examiner’s § 102 rejections as to claims 4, 5, 8, and 14 also be withdrawn.

3. 35 U.S.C. § 103 Rejections

A. Claims 5, 6, 8, 9, 11, and 12

Claims 5, 6, 8, 9, 11, and 12 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Bertram in view of Morimasa et al. (U.S. Patent 5,804,720). Applicant respectfully opposes these rejections. For the various reasons stated below, Applicant requests that the Examiner’s § 103 rejections as to claims 5, 6, 8, 9, and 11, and 12 be withdrawn.

I. All Claim Limitations Are Not Taught or Suggested

Section 2143 of the MPEP provides in part, “To establish a prima facie case of obviousness ... the prior art reference ... must teach or suggest all the Claim limitations.”

(emphasis added). As shown in the discussion of the 35 U.S.C. §102 rejection above, Betram does not teach or suggest all claim limitations of independent claim 1. Nor does the combination of Bertram and Morimasa teach or suggest all limitations of claim 1. Therefore, because dependent claims 5, 6, 8, 9, 11, and 12 include all of the limitations of claim 1, the cited references also do not teach or suggest all claim limitations of these dependent claims. Accordingly, a prima facie case of obviousness has not been established, and Applicant respectfully requests that Examiner's §103 rejections as to these dependent claims be withdrawn.

II. There Is No Basis in the Art for Combining or Modifying References

MPEP § 2143.01 provides:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

Holding that the PTO failed to establish a prima facie case of obviousness, the Federal Circuit, in *In re Geiger*, 815 F.2d 686, 2 U.S.P.Q.2d 1276 (Fed.Cir.1987), stated: "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching suggestion or incentive supporting the combination."

There is no basis in the Bertram or Morimasa references to combine the teachings therein. Bertram is directed towards a resistance temperature detector; it implements a single thin film 8 of temperature sensitive resistive material to form a resistive path. See abstract; column 2, lines 28-33. Morimasa, in contrast, is directed towards a thermal-type gas flow sensor, implementing a heater 8 and sensors 9, 10, wherein the sensors are arranged above a hollow. See abstract; column 1, lines 14-17; column 2, lines 52-56. The Morimasa device arranges the sensor portion of the device above the hollow, thereby creating a fluid flow tunnel, in order to cause the fluid to flow at a right angle to the sensor portion. Column 2, ln, 42-51. There is no suggestion supporting the combination of the sensor arrangement of Morimasa—wherein the sensors are configured above a hollow—with the substrate of Bertram, which describes a solid substrate beneath the single sensor.

Nowhere do these references suggest the desirability of any benefits that would be achieved by the combination thereof.

III. Nonanalogous Art Cannot Be Used to Establish Obviousness

MPEP 2141.01(a) provides: "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." (citations omitted). The Federal Circuit has also noted:

Patent examination is necessarily conducted by hindsight, with complete knowledge of the applicant's invention, and the courts have recognized the subjective aspects of determining whether an inventor would reasonably be motivated to go to the field in which the examiner found the reference, in order to solve the problem confronting the inventor. We have reminded ourselves and the PTO that it is necessary to consider the reality of the circumstances -- in other words, common sense -- in deciding in which fields a person of ordinary skill would reasonably be expected to look for a solution to the problem facing the inventor.

In re Oetiker, 977 F.2d 1443, 1446, 24 U.S.P.Q.2d 1443, 1445-46 (Fed.Cir.1992) (internal citations omitted).

The Bertram reference is not in the field of Applicant's endeavor; Bertram is directed towards a resistance temperature detector with a thin sensing film forming a resistive path. Additionally, the cited references also are not reasonably pertinent to the particular problem with which the inventors were concerned. The object of the Bertram reference is to provide a structure for connecting lead wires to a thin film to overcome the problem of making a good mechanical and electrical connection between a resistance element wire and the two lead wires. See column 1, lines 13-29. It is a further object of the Bertram reference to provide a reliable thin film resistance temperature detector that is tip-sensitive and has a fast response to temperature change. See column 1, lines 30-37.

The object of the Morimasa reference is to provide a thin film flow sensor that overcomes the problem of the frangible nature of thin film sensors, which is resistant to breakage from pieces of dust. See column 1, lines 43-51. The Morimasa reference teaches a bridge structure over a hollow to accomplish this object. Specifically, by arranging the sensor portion of the device above the hollow, thereby creating a fluid flow tunnel, the Morimasa device causes the fluid to flow at a right angle to the sensor portion. By so directing the fluid, Morimasa purports to avoid destruction of the sensor portion from large-diameter grain lumps by protecting the sensor portion with a guard near the hollow. See column 3, ln. 44-53. Yet such a bridge structure

and hollow would not be “reasonably pertinent” to the present invention, which claims a “substantially solid insulating sensor body,” nor to Bertram which teaches a solid substrate.

The objects of the present invention include, inter alia, providing a flow sensor that is not affected by vapor accumulation beneath the sensing elements. See Specification, p. 3, lines 12-22. A person of ordinary skill attempting to address this object could not reasonably be expected to look for a solution in the fields of lead wire connections (Bertram) and non-frangible thin film sensors (Morimasa).

B. Claims 17 and 18

Claims 17 and 18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Bertram in view of Gerblinger et al. (U.S. Patent 5,430,428). Applicant respectfully opposes these rejections. Because the cited references alone or in combination fail to teach or suggest all of the claim limitations as required by MPEP 2143, Applicant respectfully requests that the Examiner’s §103 rejection as to claims 17 and 18 also be withdrawn.

Neither the Bertram nor Gerblinger references teach a plurality of sensing elements including a heater as claimed in the present invention. Accordingly, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claim 11.

C. Claim 11

Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Bertram in view of Kushida et al. (U.S. Patent 4,400,684). Applicant respectfully opposes this rejection. Because the cited references alone or in combination fail to teach or suggest all of the claim limitations as required by MPEP 2143, Applicant respectfully requests that the Examiner’s §103 rejection as to claim 11 also be withdrawn.

Neither the Bertram nor Kushida references teach a plurality of sensing elements including a heater as claimed in the present invention. Accordingly, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claim 11.

4. Conclusion

Applicant submits that all pending claims are allowable and respectfully requests that a Notice of Allowance be issued in this case. Attached hereto as “Pending Claims,” for the

Examiner's convenience, are all the claims as pending. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at 612-607-7387. It is believed that no fees are due in connection with the filing of this paper, however the Commissioner is authorized to charge any deficiencies or credit any overpayments, including fees for any extension of time, to Deposit Account No. 50-1901 (Reference 9028-322).

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE
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IN THE SPECIFICATION

Please amend page 1, lines 6-10, as follows:

This is a continuation-in-part of U.S. Patent Application Serial No. 09/207,165, filed December 7, 1998, entitled "Rugged Fluid Flow and Property Microsensor," now U.S. Patent No. 6,184,773 _____, and U.S. Patent Application Serial No. 09/368,621 09/386,621, filed August 5, 1999, which is a Continuation-in-Part of U.S. Patent Application Serial No. 09/239,125, filed January 28, 1999, both entitled "Microsensor Housing".

Please amend page 9, lines 3-15, as follows:

Referring now to Figure 3, there is shown a cross sectional view of the glass based sensor die 121 of the present invention. While the sensor of the present invention is generally referred to as a glass based sensor, it is understood that other materials having appropriate physical characteristics could also be used. For example, alumina could be used as the base material for forming the sensor die 121. These other materials are intended to be within the scope and spirit of the present invention. A glass body 110 is used as the basis for forming sensor die 121. Upon the upper surface of glass body 110 is a layer of silicon nitride (Si_3N_5 Si_xN_y) 112 which again serves passivation and structural functions. Upon this passivation layer 112 there is constructed the heater element 114 and sensors 116, similar to those described above and well known by those skilled in the art. Once again, these heating and sensing elements can be fabricated from many materials, such as platinum. Covering the entire upper surface of the structure is a top layer 118 which serves as a protective passivation coating. Top layer 118 again is typically silicon nitride (Si_3N_5 Si_xN_y).

IN THE CLAIMS

Please amend claims 1, 4, 5, and 12 as follows:

1. A physical property sensor die, comprising:
 - a substantially solid insulating sensor body having a front surface and a back surface, wherein the substrate sensor body has a plurality of openings extending from the front surface to the back surface;
 - a plurality of at least one sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of sensing elements including at least one thermal sensor and at least one heater; and
 - a connection material filling the plurality of openings such that the plurality of sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.
4. The physical property sensor die of claim 1 wherein the plurality of sensing elements at least one sensing element includes an environmental sensor.
5. The physical property sensor die of claim 1 wherein the plurality of sensing elements at least one sensing element include a heater, a first thermal sensor, and at least a second thermal sensor.
12. The physical property sensor die of claim 6 wherein the photosensitive glass is Foturan FOTURAN.

Please cancel claims 2 and 3.

Please add the following claims.

33. The physical property sensor of claim 1 wherein the sensor body has a low thermal conductivity.
34. The physical property sensor of claim 1 wherein the sensor body is made up of PYREX.

PENDING CLAIMS

SERIAL NO. 09/656,694

1. A physical property sensor die, comprising:
 - a substantially solid insulating sensor body having a front surface and a back surface, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;
 - a plurality of sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of sensing elements including at least one thermal sensor and at least one heater; and
 - a connection material filling the plurality of openings such that the plurality of sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.
4. The physical property sensor die of claim 1 wherein the plurality of sensing elements include an environmental sensor.
5. The physical property sensor die of claim 1 wherein the plurality of sensing elements include at least a second thermal sensor.
6. The physical property sensor die of claim 1 wherein the sensor body is made up of a photosensitive glass.
7. The physical property sensor die of claim 1 wherein the sensor body is made up of a ceramic.
8. The physical property sensor die of claim 1 wherein the sensor body is made up of a highly melting glass.
9. The physical property sensor of claim 1 wherein the sensor body is highly insulating silicon.
10. The physical property sensor die of claim 7 wherein the ceramic is alumina.
11. The physical property sensor die of claim 8 wherein the ceramic is highly melting glass is fused silica.
12. The physical property sensor die of claim 6 wherein the photosensitive glass is FOTURAN.

13. The physical property sensor die of claim 1 wherein the plurality of sensing elements are constructed of platinum coated on the front surface.
14. The physical property sensor die of claim 1 wherein the substantially solid sensor body is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements.
15. The physical property sensor die of claim 1 wherein the substantially solid sensor body includes a plug made of a first material positioned below the plurality of sensing elements, the plug being surrounded by a second material which makes up the remainder of the substantially solid sensor body.
16. The physical property sensor die of claim 15 wherein the plug is substantially cylindrical.
17. The physical property sensor die of claim 14 wherein the first material is glass and the second material is alumina.
18. The physical property sensor die of claim 15 wherein the first material is glass and the second material is alumina.
33. The physical property sensor of claim 1 wherein the sensor body has a low thermal conductivity.
34. The physical property sensor of claim 1 wherein the sensor body is made up of PYREX.